User's Guide

TPS61379Q1EVM-082 Evaluation Module

ABSTRACT

This user's guide describes the setup, schematic, and layout of the evaluation module (EVM) for the TPS61379-Q1. The EVM helps to evaluate the behavior and performance of the device at different input voltage, output voltage, and load conditions. This EVM is optimized for 3.3-V to 6.5-V input voltage and 9-V output voltage applications. The feedback divider and compensation network can be modified for other application conditions, according to the data sheet.

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Trademarks

1 Introduction

The TPS61379-Q1 is a fully-integrated synchronous boost converter with load disconnect function integrated. The device is suitable as a post-boost for automotive applications with a programmable current limit up to 2 A and maximum 18.5-V output voltage. This EVM is optimized for 3.3-V to 6.5-V input voltage and 9-V output voltage applications. The operating conditions of the EVM can easily be changed by modifying the external components of the TPS61379-Q1 device.

1.1 Performance Specification

Table 1-1 provides the summary of the TPS61379Q1EVM performance specifications. All the specifications are given for an ambient temperature of 25°C.

Table 1-1. Performance Specification

Specification	Test Condition	MIN	TYP	MAX	UNIT
Input voltage		3.3	5.0	6.5	V
Output voltage	V_{IN} = 5 V, I_O= 0.5 A	8.8	9	9.2	V
Output current	V_{IN} = 3.3 V		0.3		A
	V_{IN} = 5 V		0.45		
Switching frequency			2.2		MHz

1.2 Modification

The external components of the TPS61379-Q1 device can be modified to adjust to output voltage, switch current limit, switching frequency, and response speed of real applications. For V_{IN} higher than 6.0-V condition, the resistor R10 should be soldered as EN maximum voltage rating is 6.0 V.

1.3 Input Capacitor C9

The 47-uF, 25-V, tantalum capacitor C9 is added as the input capacitor in the EVM. The ESR of the tantalum capacitor is 0.12 Ω to damp the ringing of the input capacitor when the EVM is powered by a power supply with a long cable. The capacitor is not necessary and can be removed in a real application.

2 Test Setup

This section describes how to properly connect, set up, and use the TPS61379Q1EVM-082.

2.1 Input/Output Connector Descriptions

See the following:

TP1	Positive connection of the power supply
TP2	Positive connection for the load
TP3	Negative connection of the power supply
TP4	Negative connection for the load
TP5	Test point to measure the Bode plot
TP6	Test point to measure SW pin waveform
J1	Input voltage sensing for measuring efficiency. VIN_S+ is for positive input and VIN_S- is for negative input.
J2	Output voltage sensing for measuring efficiency. VOUT_S+ is for output positive node and VOUT_S- is for output negative node.
J3	MODE pin input jumper. Place a jumper across MODE and VCC to set in forced PWM mode, place a jumper across MODE and GND to set in auto PFM mode.
J4	EN pin input jumper. Place a jumper across EN and ON to turn on the IC. Place a jumper across EN and OFF to turn off the IC.
J5	Fixed output voltage selection jumper. Solder a 0 Ω at R14. Place a jumper across pin 1 and pin 2 to set 5-V fixed V_{OUT}, place a jumper across pin 3 and pin 4 to set 5.25-V fixed V_{OUT}, place a jumper across pin 5 and pin 6 to set 5.5-V fixed V_{OUT}.

3 Schematic and Bill of Materials

This section provides the TPS61379Q1-082 schematic and bill of materials (BOM).

3.1 Schematic

Figure 3-1 shows the TPS61379Q1EVM-082 schematic.

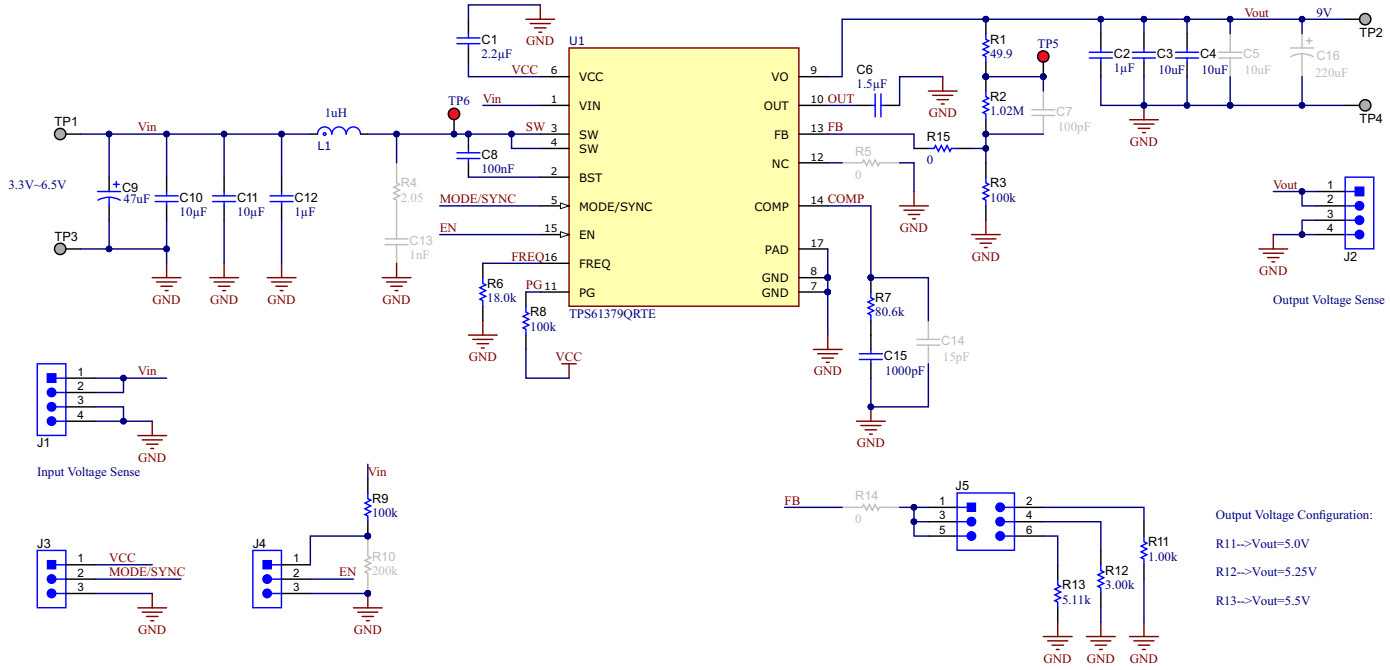

Figure 3-1. TPS61379Q1EVM-082 Schematic

3.2 Bill of Materials

Table 3-1 lists the BOM of the TPS61379Q1EVM-082.

Table 3-1. TPS61379Q1EVM-082 Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
C1	1	2.2 uF	CAP, CERM, 2.2 µF, 10 V, ±10%, X7R, AEC-Q200 Grade 1, 0603	0603	GRM188R71A225KE15J	MuRata
C2	1	1 uF	CAP, CERM, 1 uF, 25 V, ±10%, X7R, AEC-Q200 Grade 1, 0603	0603	GCM188R71E105KA64D	MuRata
C3, C4	2	10 uF	CAP, CERM, 10 uF, 16 V, ±10%, X7R, AEC-Q200 Grade 1, 1206	1206	GCM31CR71C106KA64L	MuRata
C6	1	1.5 uF	CAP, CERM, 1.5 uF, 25 V, ±10%, X7R, 0805	0805	GCJ21BR71E155KA01	MuRata
C8	1	0.1 uF	CAP, CERM, 0.1 uF, 50 V, ±10%, X7R, 0603	0603	GCM188R71H104KA57D	MuRata
C9	1	47 uF	CAP, TA, 47 uF, 25 V, ±20%, 0.12 ohm, SMD	7343-31	T495D476M025ATE120	Kemet
C10, C11	2	10 uF	CAP, CERM, 10 µF, 10 V, ±10%, X7R, AEC-Q200 Grade 1, 0805	0805	GCJ21BR71A106KE01L	MuRata
C12	1	1 uF	CAP, CERM, 1 µF, 10 V, ±5%, X7R, AEC-Q200 Grade 1, 0603	0603	C0603X105J8RAC7867	Kemet
C15	1	1000 pF	CAP, CERM, 1000 pF, 50 V, ±10%, X7R, AEC-Q200 Grade 1, 0402	0402	GCM155R71H102KA37D	MuRata
J1, J2	2		Header, 100 mil, 4 × 1, Gold, TH	4 × 1 Header	TSW-104-07-G-S	Samtec
J3, J4	2		Header, 100 mil, 3 × 1, Gold, TH	3 × 1 Header	TSW-103-07-G-S	Samtec
J5	1		Header, 100 mil, 3 × 2, Gold, TH	3 × 2 Header	TSW-103-07-G-D	Samtec
L1	1	1uH	Molded Power Inductor, Shielded, 1uH 20%, 7.9A, 21.3mOhm DCR Max, AEC-Q200, T/R	3.2 × 3.5 mm	XGL3515-102MEC	Coilcraft
R1	1	49.9	RES, 49.9, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040249R9FKED	Vishay-Dale
R2	1	1.02 Meg	RES, 1.02 M, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04021M02FKED	Vishay-Dale
R3, R8, R9	3	100 k	RES, 100 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402100KFKED	Vishay-Dale
R6	1	18.0 k	RES, 18.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040218K0FKED	Vishay-Dale
R7	1	80.6 k	RES, 80.6 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040280K6FKED	Vishay-Dale
R11	1	1.00 k	RES, 1.00 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04021K00FKED	Vishay-Dale
R12	1	3.00 k	RES, 3.00 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04023K00FKED	Vishay-Dale
R13	1	5.11 k	RES, 5.11 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04025K11FKED	Vishay-Dale

Table 3-1. TPS61379Q1EVM-082 Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
R15	1	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04020000Z0ED	Vishay-Dale
SH-JP1, SH-JP2	2		Shunt, 100 mil, Gold plated, Black	Shunt 2 pos. 100 mil	881545-2	TE Connectivity
TP1, TP2, TP3, TP4	4		Terminal, Turret, TH, Double	Keystone1502-2	1502-2	Keystone
TP5, TP6	2		Test Point, Multipurpose, Red, TH	Red Multipurpose Test Point	5010	Keystone
U1	1		25-uA Quiescent Current, 2-A Switch Current Synchronous BOOST CONVERTER with Load Disconnection, RTE0016C (WQFN-16)	RTE0016C	TPS61379QRTE	Texas Instruments
C5	0	10 uF	CAP, CERM, 10 uF, 16 V, ±10%, X7R, AEC-Q200 Grade 1, 1206	1206	GCM31CR71C106KA64L	MuRata
C7	0	100 pF	CAP, CERM, 100 pF, 50 V, ±10%, X7R, 0402	0402	885012205055	Wurth Elektronik
C13	0	1000 pF	CAP, CERM, 1000 pF, 100 V, ±10%, X7R, 0603	0603	GRM188R72A102KA01D	MuRata
C14	0	15 pF	CAP, CERM, 15 pF, 50 V, ±5%, C0G/NP0, 0402	0402	GRM1555C1H150JA01D	MuRata
C16	0	220 uF	CAP, Polymer Hybrid, 220 uF, 25 V, ±20%, 27 ohm, 8 × 10 SMD	8 × 10	EEHZC1E221P	Panasonic
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
R4	0	2.05	RES, 2.05, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW08052R05FKEA	Vishay-Dale
R10	0	200 k	RES, 200 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW0402200KFKED	Vishay-Dale
R5, R14	0	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04020000Z0ED	Vishay-Dale

4 Board Layout

The TPS61379Q1EVM board is a 4-layer, 2-oz copper thick PCB. All the components are placed on the top layer. Figure 4-1 and Figure 4-2 show the top view and bottom view, respectively. Figure 4-3 and Figure 4-4 show the inner layer 1 and inner layer 2, respectively.

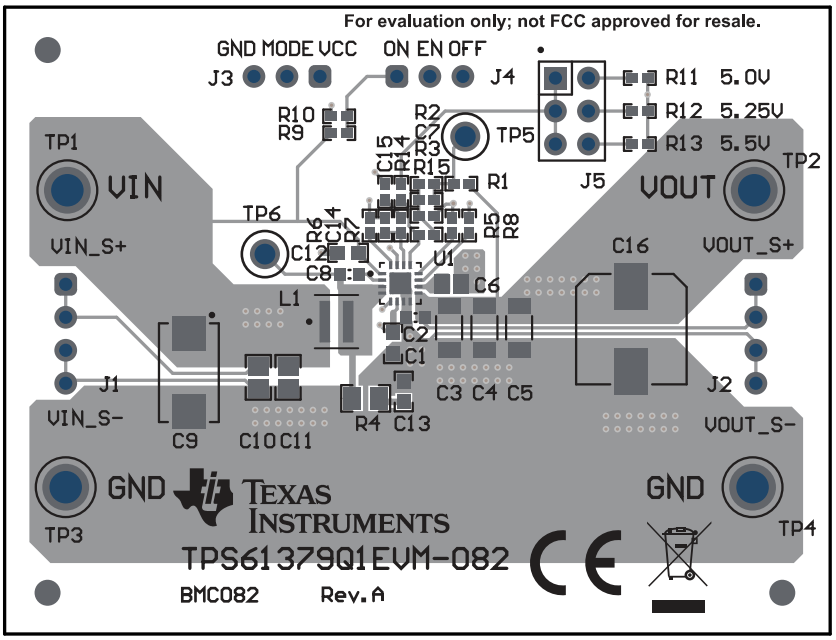

Figure 4-1. TPS61379Q1EVM-082 Top-Side Layout

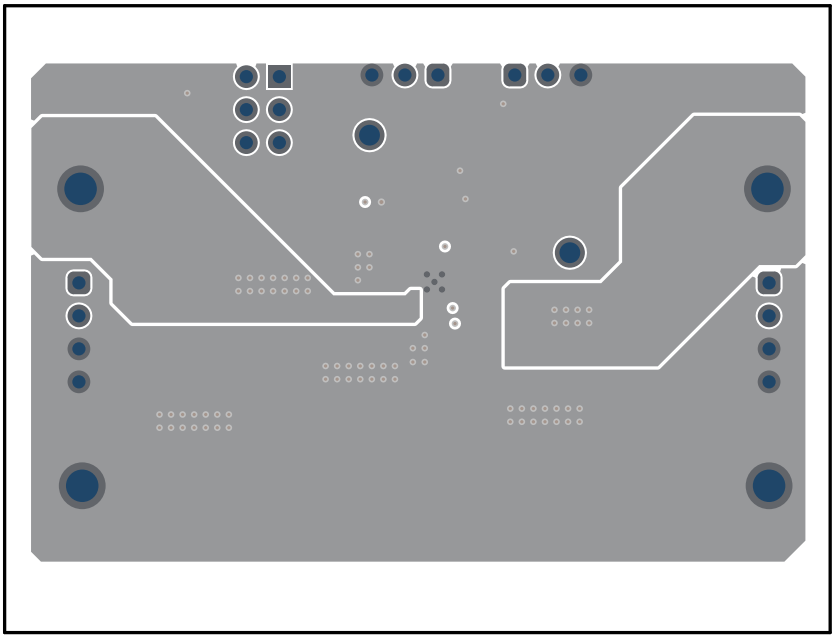

Figure 4-2. TPS61379Q1EVM-082 Bottom-Side Layout

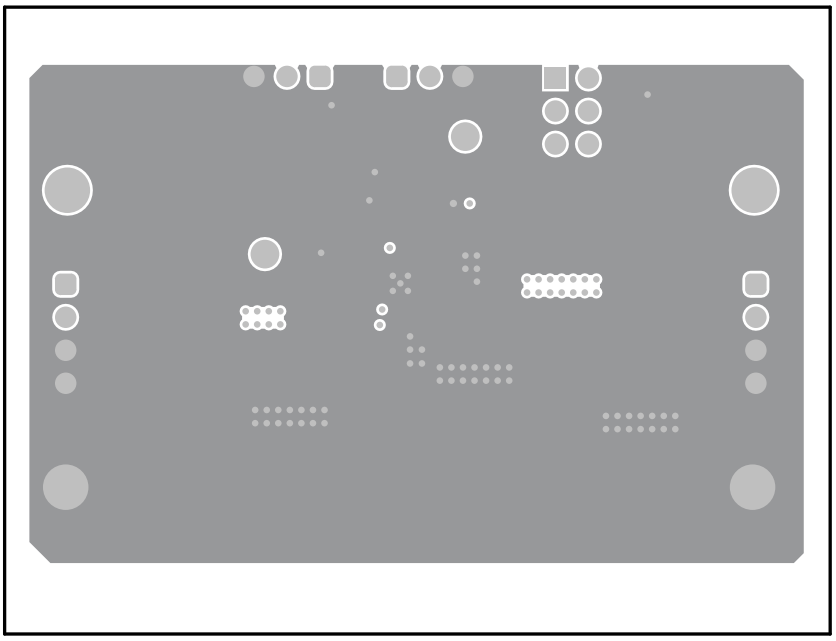

Figure 4-3. TPS61379Q1EVM-082 Inner Layer 1 Layout

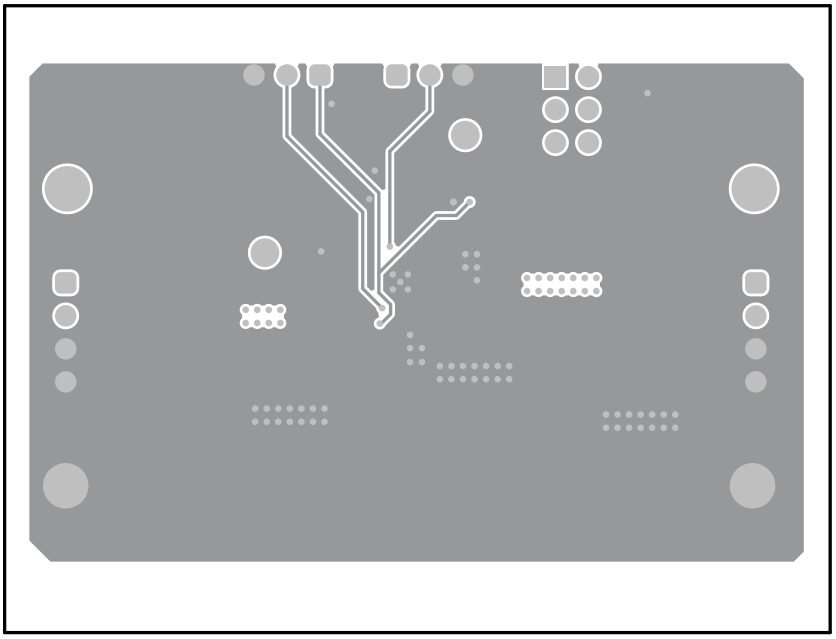

Figure 4-4. TPS61379Q1EVM-082 Inner Layer 2 Layout

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265